

INHIBITORY EFFECT OF SOLUBLE METABOLITES OF *TRICHODERMA AFROHARZIANUM* ON THE MYCELIAL GROWTH OF POSTHARVEST PATHOGENS

K. MIHÁLY¹, A. ZABIÁK², A. CSÓTÓ², E. SÁNDOR³

¹*FruitVeB Hungarian Interprofessional Organization for Fruit and Vegetable, Debrecen, Hungary*

²*Institute Food Science, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, Debrecen, Hungary*

³*Hungarian Chamber of Professionals and Doctors of Plant Protection, Budapest, Hungary*



INTRODUCTION

- Invasive pests, plant diseases cost 220 billion dollars each year
- F&V supply deficit, not procedure enough F&V to meet recommended intake levels
- Postharvest losses
- Consumers increasingly reject chemical residues, want safe food
- Double challenge: reducing postharvest losses while moving away from traditional synthetic fungicides toward safer alternatives

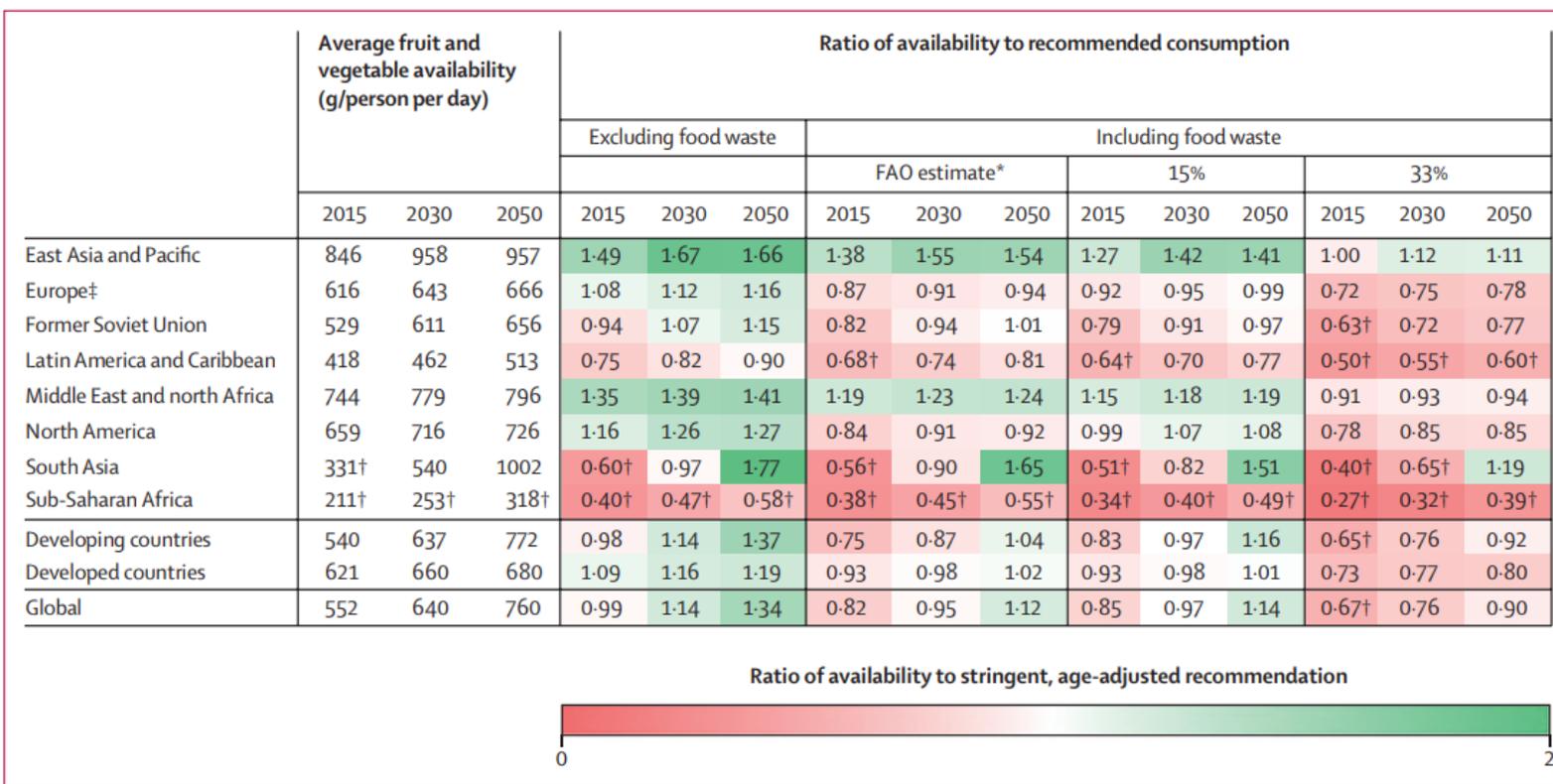


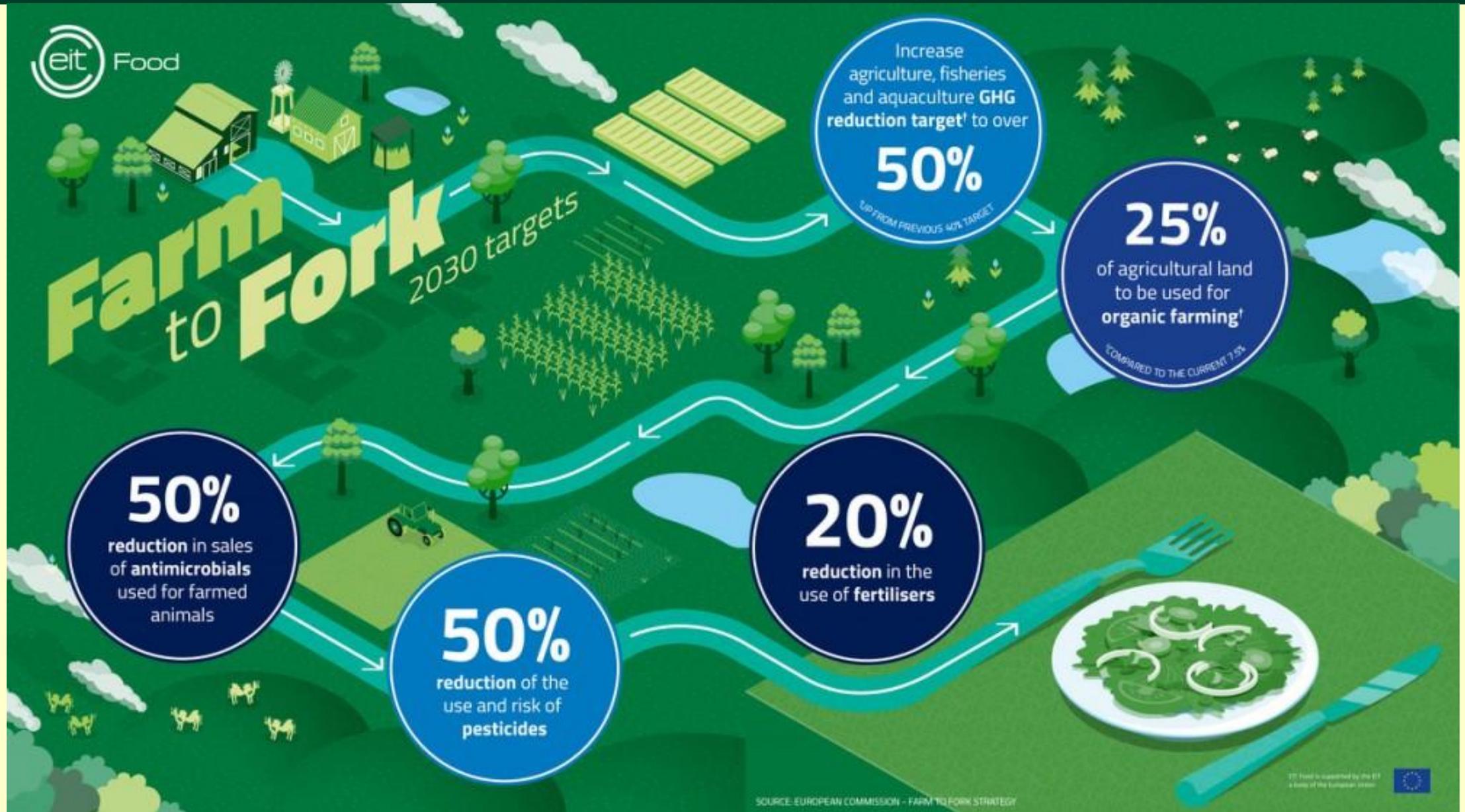
Figure 2: Regional summary of ratios of average fruit and vegetable availability to recommended consumption levels including and not including various levels of food waste
 Projections are considered under Shared Socioeconomic Pathway 2. Availability is population-weighted average for each region. Recommended consumption levels are 330–600 g/person per day, depending on age. FAO=Food and Agriculture Organization of the United Nations. *FAO waste estimates vary by region and range from 5% in sub-Saharan Africa to 28% in east Asia and Pacific and North America. †Fails to achieve the 400 g/person per day minimum recommendation. ‡Includes Baltic states.

Daniel Mason-D'Croz, Jessica R Bogard, Timothy B Sulser, Nicola Cenacchi, Shahnila Dunston, Mario Herrero, Keith Wiebe, **Gaps between fruit and vegetable production, demand, and recommended consumption at global and national levels: an integrated modelling study**, *The Lancet Planetary Health*, Volume 3, Issue 7, 2019, Pages e318-e329, ISSN 2542-5196, [https://doi.org/10.1016/S2542-5196\(19\)30095-6](https://doi.org/10.1016/S2542-5196(19)30095-6).

GREEN DEAL



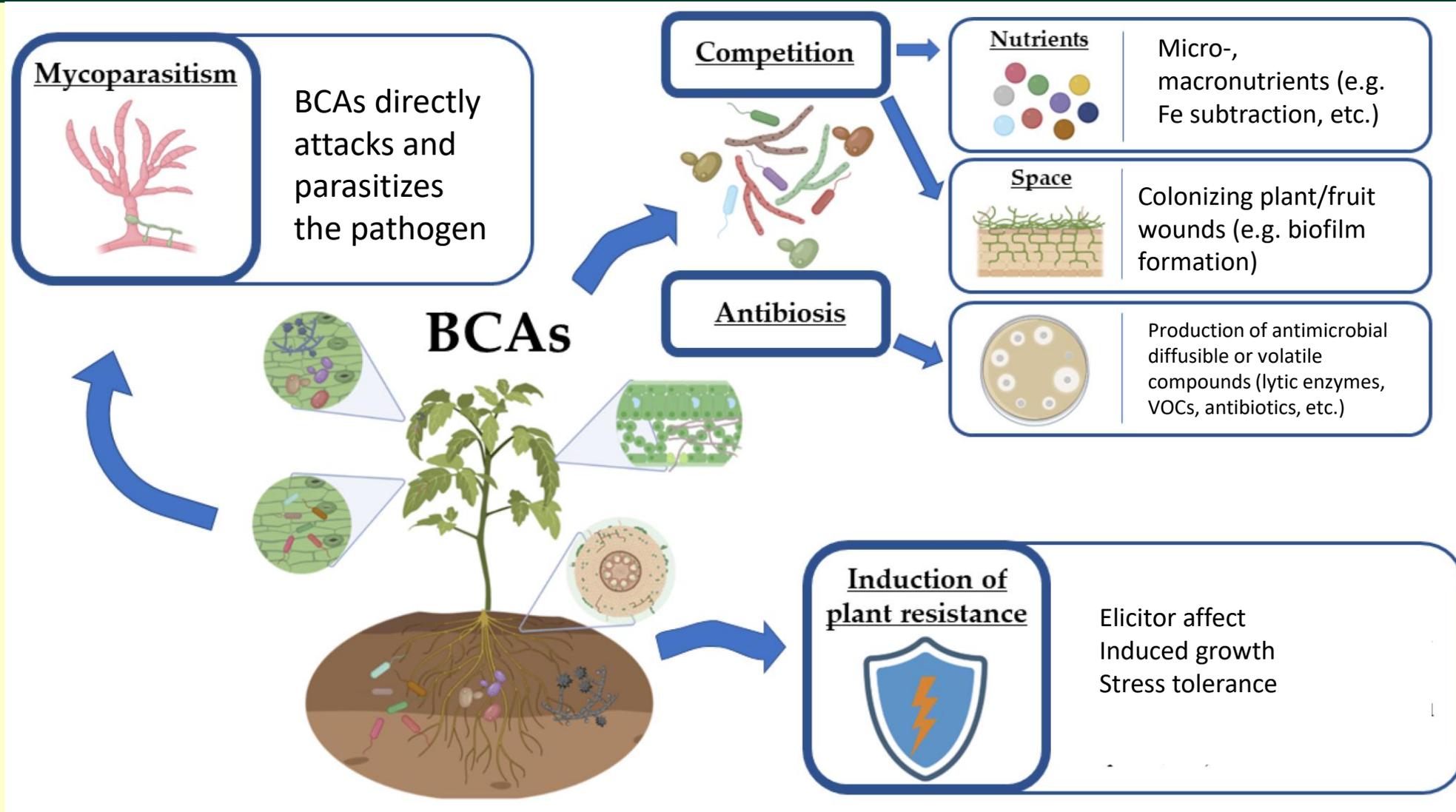
FARM TO FORK



COST FoodWaStop conference in Zadar, 4-6 February 2026

BIOCONTROL AGENTS (BCAs)

- Alternative methods: Antagonists (bacteria, yeasts, molds)
- Advantages: no residues and food withdrawal period, low ecological impact

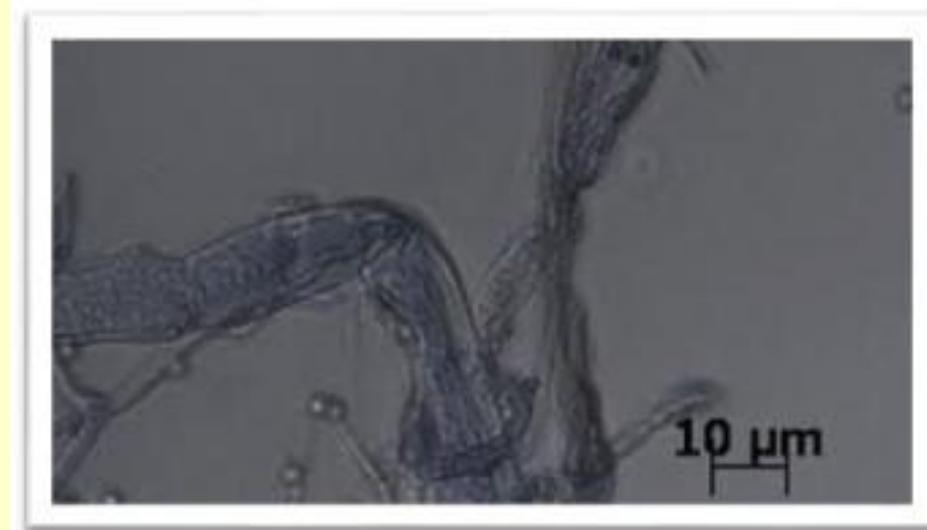


Palmieri D, Ianiri G, Del Grosso C, Barone G, De Curtis F, Castoria R, Lima G. Advances and Perspectives in the Use of Biocontrol Agents against Fungal Plant Diseases. *Horticulturae*. 2022; 8(7):577. <https://doi.org/10.3390/horticulturae8070577>

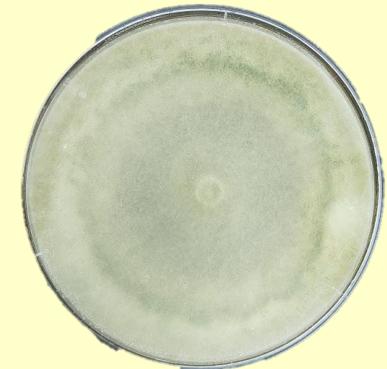
TRICHODERMA spp.

- Soil, some rhizosphere, some in/on plant
- Indirect mechanisms
 - Induced systemic resistance (SAR), growth promotion
- Direct mechanisms:
 - Mycoparasitism
 - Nutrient competition
 - Production of:
 - Antimicrobial compounds (chitinases, glucanases)
 - Secondary metabolites (Volatile and **non-volatile substances**)

Study: Inhibitory effect of soluble metabolites of *Tr. afroharzianum* on mycelial growth of postharvest pathogens



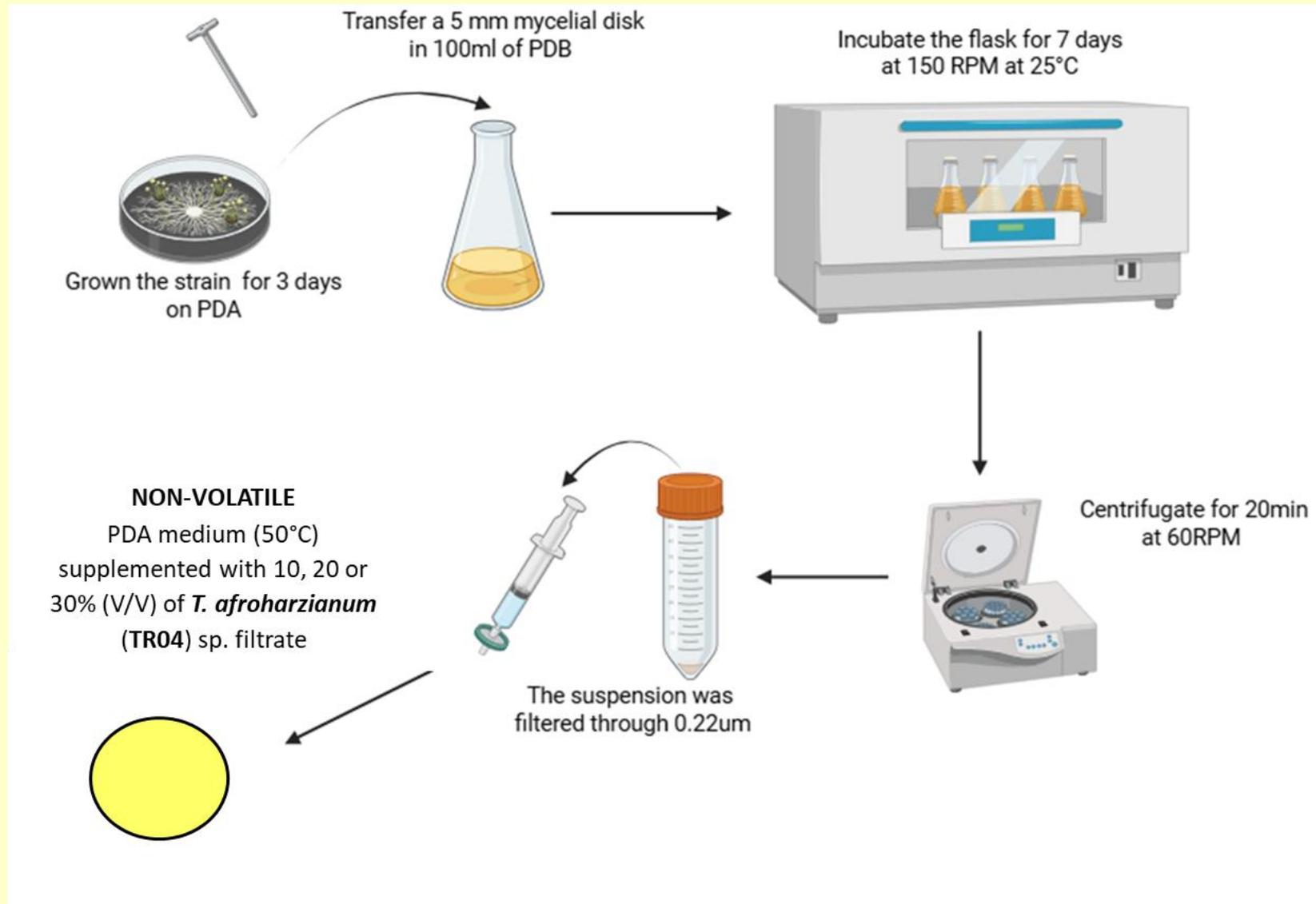
Kovács, C.; Csótó, A.; Pál, K.; Nagy, A.; Fekete, E.; Karaffa, L.; Kubicek, C.P.; Sándor, E. The Biocontrol Potential of Endophytic *Trichoderma* Fungi Isolated from Hungarian Grapevines. Part I. Isolation, Identification and In Vitro Studies. *Pathogens* **2021**, *10*, 1612. <https://doi.org/10.3390/pathogens1012161>



Trichoderma afroharzianum

MATERIAL AND METHODS

Production of secondary metabolites and non-volatile substances



MATERIAL AND METHODS

Testing fungal species:

- Isolated from the surface of sour cherries
- Molecular identification: ITS1 and ITS4

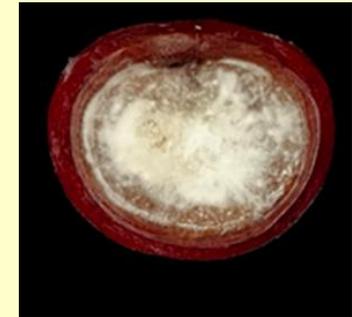
<i>Alternaria alternata</i>	<i>Colletotrichum godetiae</i>
<i>Botrytis cinerea</i>	<i>Fusarium sporotrichioides</i>

PDA medium, 5 repetitions

TR04 filtrate concentrations: Control, 10%, 20% , 30%

Measurement of the daily growth of mycelium

$$\text{Inhibitory effect of growth (\%)} = \left(1 - \frac{d_i}{d_c}\right) \times 100$$



Xiaoqi Yang, Shuodan Hu, Daixin Dong, Chuanqing Zhang, Diversity of *Colletotrichum* species causing cherry postharvest anthracnose in China, *Physiological and Molecular Plant Pathology*, Volume 134, 2024, 102390, ISSN 0885-5765, <https://doi.org/10.1016/j.pmpp.2024.102390>.

Liu, Ting & Xu, Xi & Han, Chuang & Wang, Yumeng & Zhang, Li & Guo, Lifeng & Chen, Yibing & Song, Zhen & Wang, Xiangjing & Xiang, Wensheng & Zhao, Junwei. (2024). Fungal diversity associated with cherry fruit rot in the Shandong province, China. *Journal of Phytopathology*. 172. 10.1111/jph.13361.

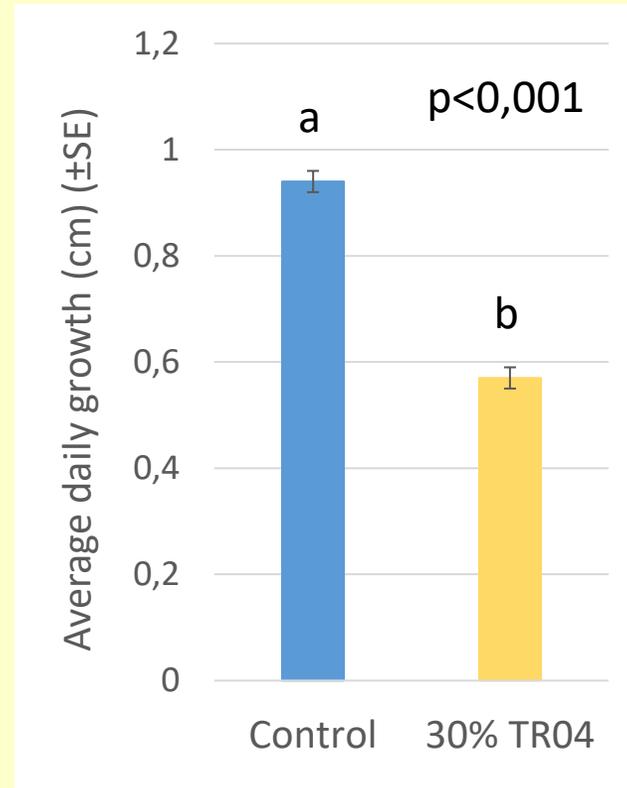
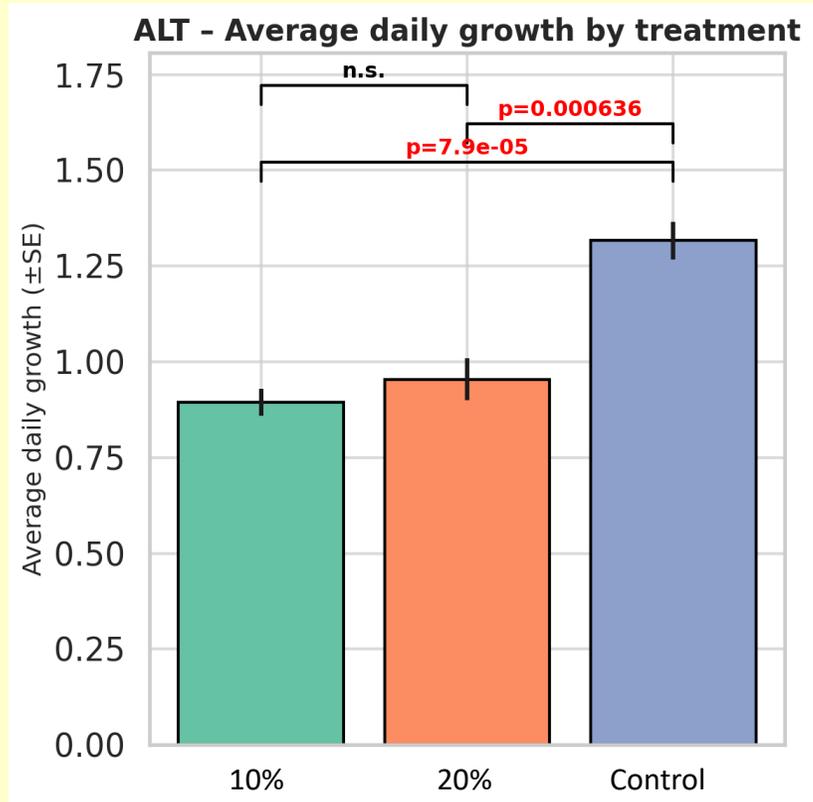
RESULTS



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ALTERNARIA ALTERNATA

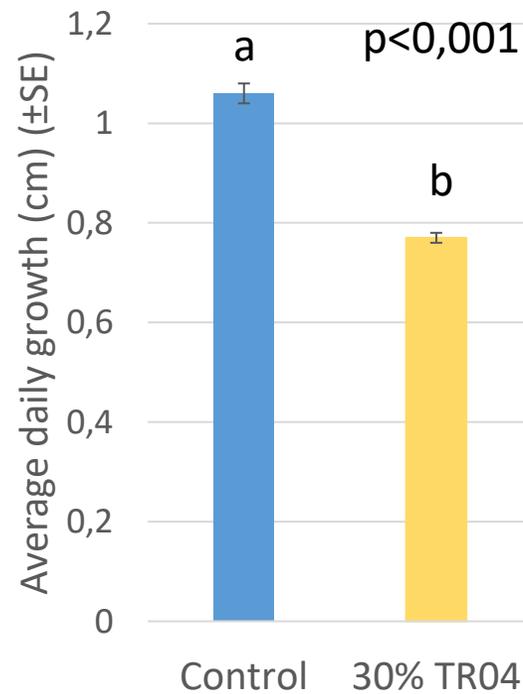
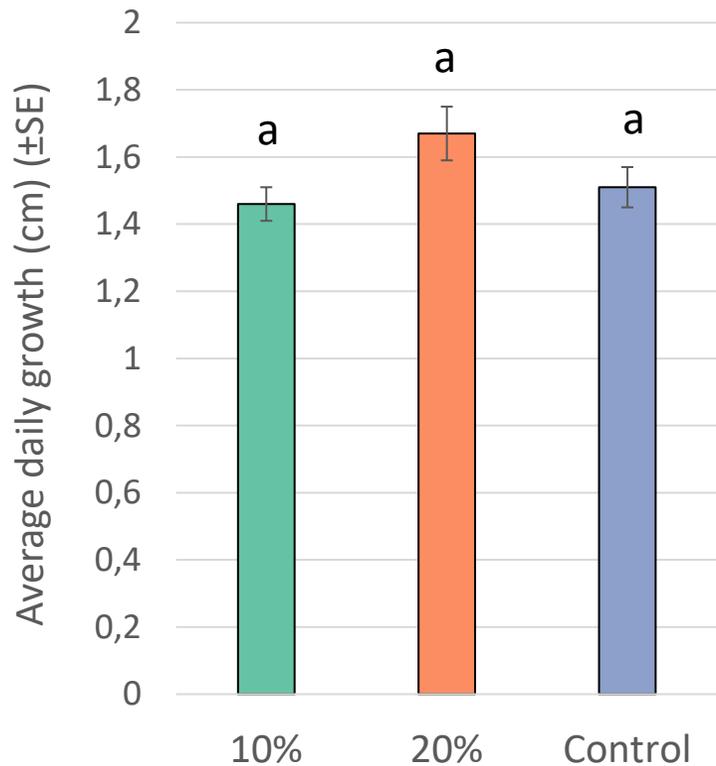
- All three concentrations, different inhibition rate
- 30% filtrate more effective



Inhibitory effect (%)			
Concentration	10%	20%	30%
TR04 filtrate	14,1	16,7	32,2

FUSARIUM SPOROTRICHIOIDES

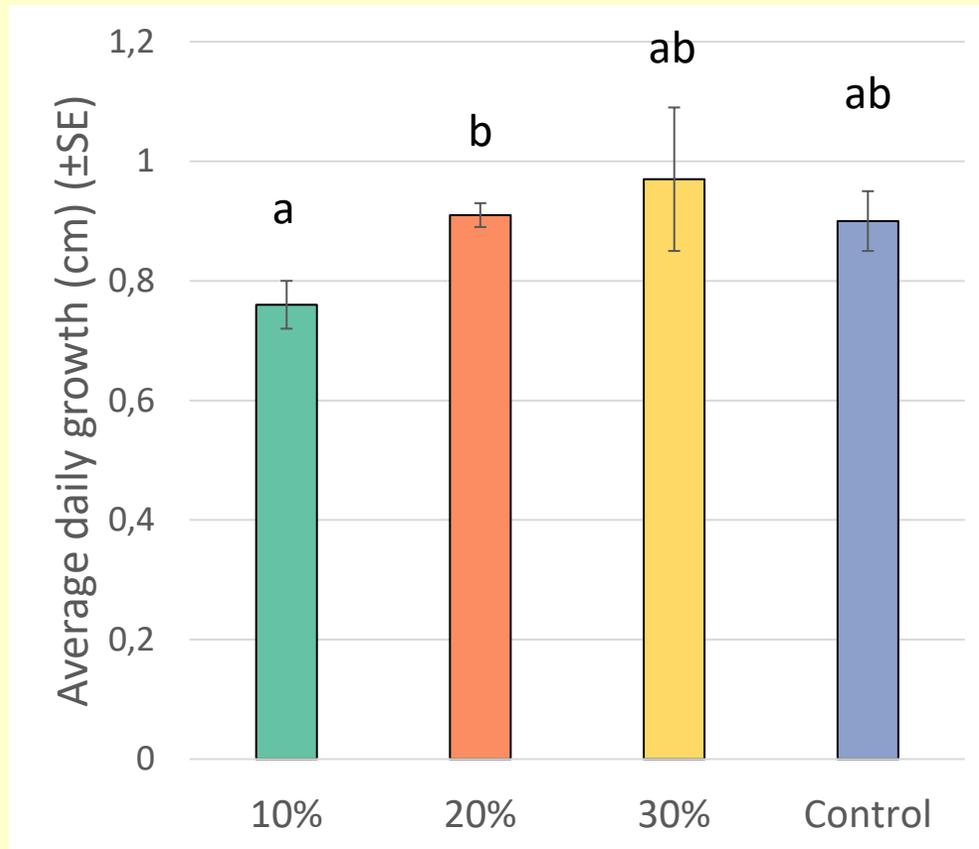
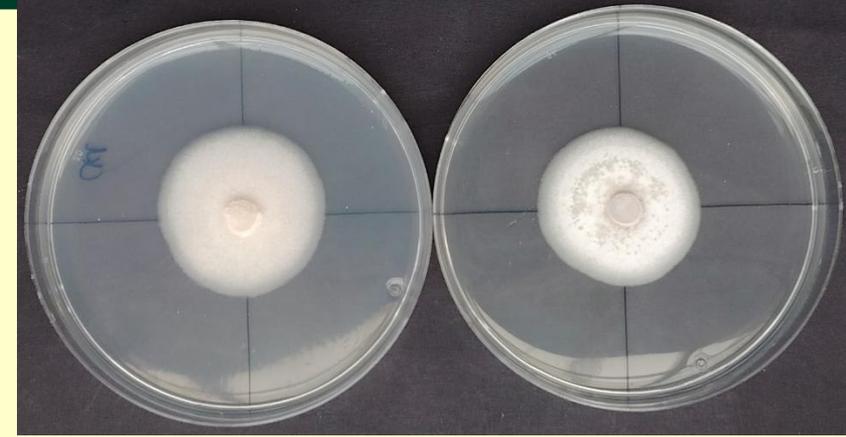
- 10% and 20% no inhibition
- Significant difference at 30% filtrate



Inhibitory effect (%)			
Concentration	10%	20%	30%
TR04 filtrate	3,5	-7,6	22,0

COLLETOTRICHUM GODETIAE

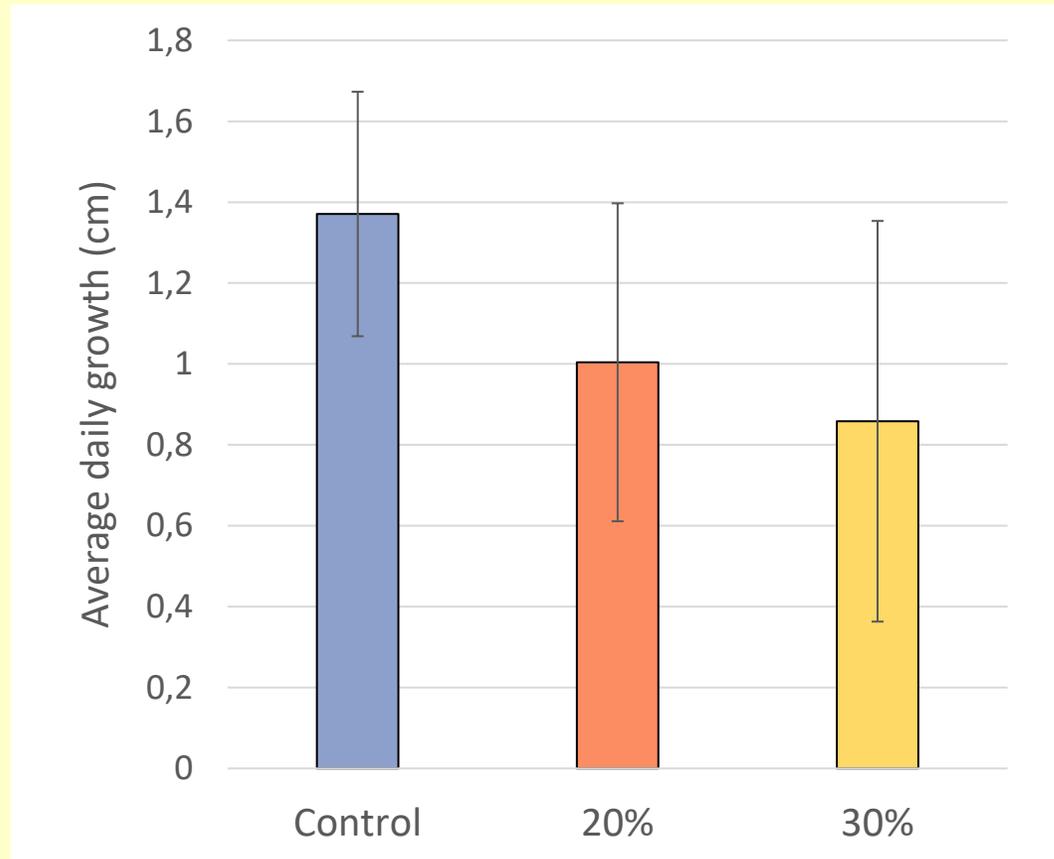
- No inhibitory effect can be detected



Inhibitory effect (%)			
Concentration	10%	20%	30%
TR04 filtrate	5,5	4,8	-0,7

BOTRYTIS CINEREA

- Inhibition was visible but statistically different was not observed



Inhibitory effect (%)			
Concentration	10%	20%	30%
TR04 filtrate	-	24,8	42,4

SUMMARY

- Effective growth inhibition in the case of *Alternaria alternata*, *Fusarium sporotrichioides*
- *Colletotrichum godetia*, *Botrytis cinerea* no statistical difference can be detected
- Analysis of TR04 filtrate
- Further testing with other postharvest pathogens *in vitro*
- Postharvest treatment *in planta*



THANK YOU FOR YOUR ATTENTION!